BRIEF COMMUNICATION

A SYSTEMATIC EFFECT OF STOCKING INTENSITY UPON THE SPECIFIC DEFOLIATION RATE OF SALTBUSH BY SHEEP

This extends earlier studies of sheep grazing saltbush shrubland near Whyalla, South Australia, where times spent in the different parts of the flock's range had been shown to be indicated by the corresponding depositions of the egesta[1,2]. That result enables quantitative estimates (ha sheep^{-1}) to be made of the stocking intensities experienced in each of the different parts of the range (SIP - stocking intensity of the part), by combining flock size, part area, and range egesta accumulations in an appropriate formula.[2]

It also has been shown[3] that SIP varies greatly throughout each flock's range in a consistent way, whether in the full-scale paddocks of the region or in very small experimental enclosures. Roughly a third of the range experiences SIP grading upwards from the paddock average stocking intensity (PSI = total area divided by flock size), the remainder grading downwards. Greatest intensities are of magnitudes equivalent to about 7 PSI; lowest measurable intensities have values roughly equivalent to the PSI/16.

Lastly, it has been shown, in several cases, by use of a leaf-marking technique[4] that the extent of defoliation of saltbushes in the various parts of the rangeland is linearly related to the concomitant accumulations of sheep egesta in those parts. Thus the situation has been reached where inferred SIP and its immediate effects on plants such as saltbush, can be studied across the various open localities, without constraining the flock's behaviour.

The present report describes an unexpected new quantitative feature of those inter-relationships, revealed from a small enclosure of saltbush stocked with sheep.

An enclosure 35×100 m was fenced off in the midst of extensive saltbush shrubland on Middleback Station near Whyalla, S. Aust., a locality described in detail by Barker[5] and Noble[6]. The shrubland was dry and devoid of any green grass, due to drought. Survey poles were set about this enclosure such that observers could visually sector it into ten equal cells, and each cell into halves, by line-of-sight. A drinking-trough and a holding-pen were installed at one end.

In each cell, bushes were counted and 100 leaves of their outermost foliage were marked, distributing the marks widely amongst the bushes[4]. The percentage loss of saltbush foliage from each cell was estimated also by the method of Andrew *et al.*[7] A flock of seven merino wethers (20 sheep ha^{-1}) was introduced and left for six days except for an inspection period every 24 h, during which the sheep were penned. At each inspection, all egesta was recovered and measured from each half-cell separately, counts were made of the loss of marked leaves, and the saltbush foliage biomass was estimated in each cell. During daylight, the activity of the flock was observed from a distance.

Contrary to usual outcomes, the sheep in this enclosure did not settle down for nearly three days. Instead they spent much more time than expected in the southern (down-wind) end of the enclosure just standing. No reason for this was apparent. During the first three days a high proportion of marked leaves which were lost from bushes could be observed uneaten, lying on the ground, and thus were evidently broken off simply by the passage of the sheep. These were removed. By the morning of the fourth day the sheep were grazing normally.

However, no statistically-significant relationships could be demonstrated at the end of the experiment, between cell egesta accumulation and either of cell saltbush leaf loss, or cell saltbush foliage biomass reduction. Even when the two camped-on cells were disregarded, no significant trends could be detected from the remaining cells. This was contrary to the results of at least two earlier experiments, in which the relationships were significant.

From a general point of view, the outcome thus appeared to be of an atypical grazing episode (Fig. 1) in which flock behaviour was too aberrant for the expected egesta deposition–saltbush defoliation relationships to be expressed.

It was therefore remarkable to discover that in each cell considered separately, the progressive accumulation of egesta and the progressive removal of marked saltbush leaves by the sheep, were fairly closely and smoothly related (Fig. 2). The further remarkable feature was that

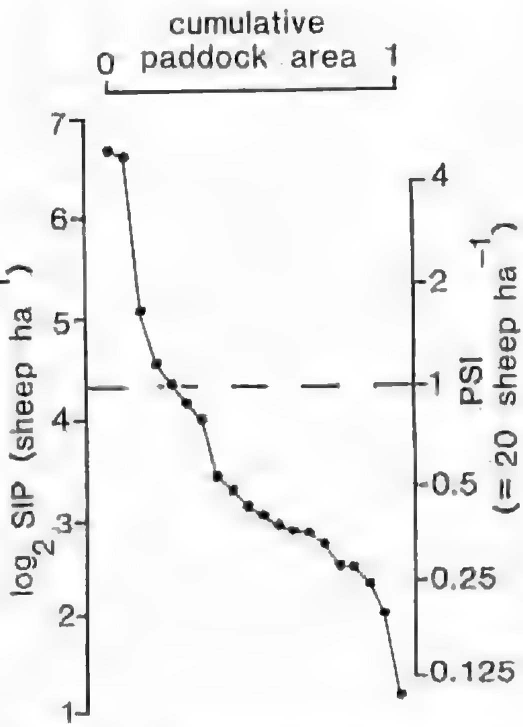

Fig. 1. The cumulative distribution of $\log_2$ SIP (stocking intensity of the part) for the 20 parts of the sheep-stocked saltbush enclosure. The right-hand scale expresses SIP variation in terms of PSI (paddock average stocking intensity). By comparison with Hilder's 1964 data (see Fig. 1 of Lange 1985), note the atypically low proportion of SIP ≥ PSI.

the slopes of these relationships, i.e. egesta accumulated per tagged leaf taken—appeared to vary between cells in a very systematic way.

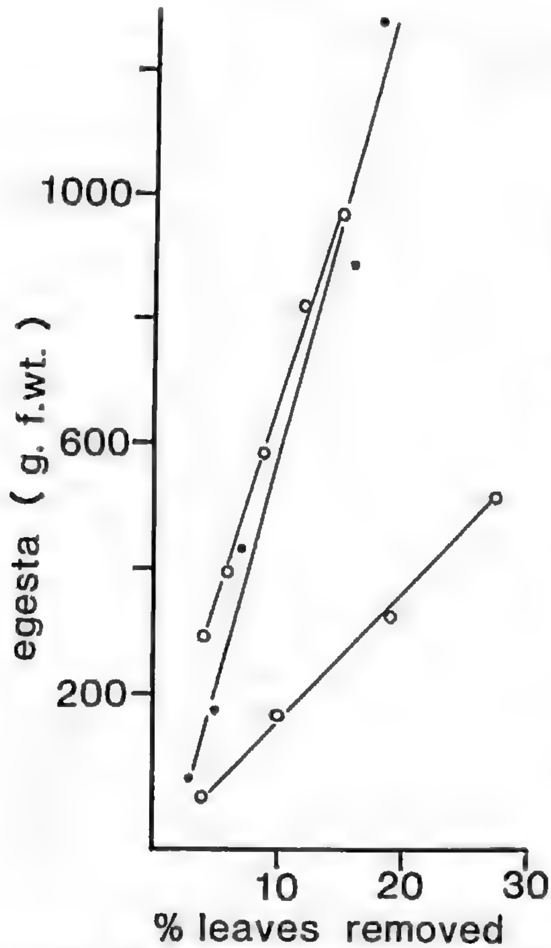

Fig. 2. Cumulative egesta accumulation *versus* cumulative loss of marked saltbush leaves for 3 representative cells from the enclosure. Note how slopes are steeper in cells that accumulated more egesta. Lines with less than 6 points involved days with no sheep visits.

That is shown in Fig. 3 for the eight non-camped cells, where these slopes are plotted against the total fresh weights of sheep egesta deposited on the cells over the six-day period. The equation of the linear regression is:

$$y = -24 + 6.49\,x,\ r^2 = 0.86,\ p < 0.001,$$

where y = g egesta deposited per 1% tagged leaf removed (= slope), and x is kg egesta deposited. The intercept is not significant.

When the slopes are plotted against the natural logarithm of cell egesta accumulations, all ten cells including the camp-sites are accommodated in a very highly significant regression:

$$y = -156 + 88.5 \ln(x),\ r^2 = 0.92,\ p < 0.001.$$

In this case the intercept is significant.

These results reveal an unsuspected quantitative interrelationship in flock-browse plant interaction, which is too significant to dismiss without attention.

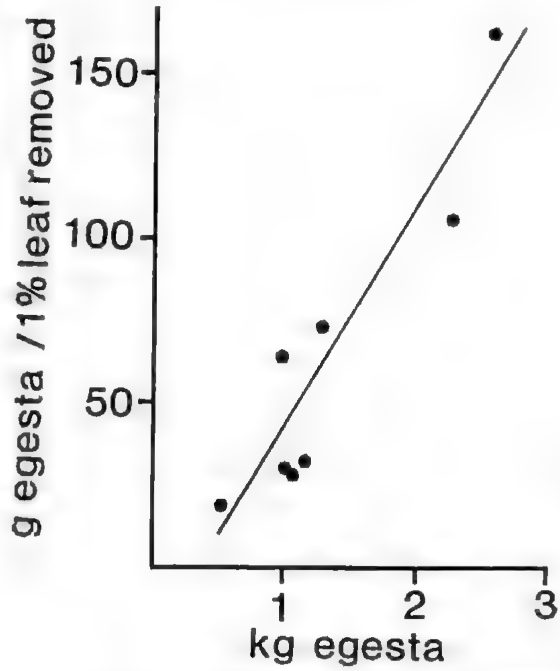

Fig. 3. Slopes as in Fig. 2, for each of the 8 non-camped cells of the enclosure, *versus* the corresponding totals of sheep egesta accumulated in cells over the 6-day period.

On face value, the results imply that as SIP rises, the systematic defoliation rate of the saltbush by the sheep falls.

Since marked leaves were observed lying detached upon the ground, during the early part of the six-day period, interpretation must allow for effects due to the mere passage of sheep, as well as direct browsing.

On general grounds, one might have thought that if there was to be an effect of this nature, then it might have increased not decreased the specific defoliation rate. That is, crowding as SIP increased might have been expected to increase incidental physical damage to saltbushes, thus removing more leaves per sheep, not less. But the reverse applied. Bush density did vary slightly from cell to cell, but not in any way that explained this effect.

The effect remains unexplained and serves as a reminder that little is yet understood of fine details at the grazing interface between sheep and saltbush. Since it is demonstrated so far only from this single experiment, it requires verification, and further trials will be undertaken

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R. T. LANGE, Botany Dept, University of Adelaide, Box 498, G.P.O. Adelaide, S. Aust. 5001.

NEW RECORDS OF SPIDERS (ARACHNIDA: ARANEAE) FROM SOUTH AUSTRALIA

BY BERNARD GUERIN

Summary

The spider fauna of South Australia is largely unknown due to a lack of systematic collecting over the years. Few studies have been published and these are based on material collected incidentally to other groups. Thus the larger and wandering spiders are better known than cryptic and nocturnal species.